Title of Paper:	Critical Needs for better Management of the Environment and Security
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CEOS Priorities

The Committee on Earth Observation Satellites (CEOS) was established in 1984 under the auspices of G7. Since then, it has had a remarkable impact on the coordination of activities and programmes of space agencies world-wide in order to put space technology at the disposal of decision makers for the benefit of mankind. CEOS is recognized as the major international forum for the coordination of Earth observation satellite programs and for the interaction of these programs with the users of satellite data worldwide. The work of CEOS spans the full scope of activities required for the proper international coordination of Earth observation programs and the maximum utilization of their data, ranging from the development of detailed technical standards for data product exchange to the establishment of high-level interagency agreements.

During 2002, under the Chairmanship of Prof. José Achache of ESA, the European Space Agency, CEOS focused its efforts on the World Summit on Sustainable Development (WSSD), which took place in Johannesburg in September 2002. At the WSSD, Heads of States and Governments committed to the Plan of Implementation for Agenda 21, integrating the three pillars of sustainable development - economic development, social development and environmental protection - at local, national, regional and global levels. The world leaders have recognised that the population growth from 6 billion to 9 billion within the next 50 years, and the competition for the Earth's limited resources, can only be achieved in a manageable manner if decision makers have access to timely, global and accurate information and that Earth observation from space, as well as in situ, has to play a key role in the management of our Planet.

As coined by Prof. Achache at the World Summit: "There is no sustainable development without adequate information about the state of the Earth and its environment." To turn words into action, CEOS went one step further and launched a CEOS WSSD Follow-up Programme, which was adopted at its 16th Plenary meeting in November 2002, hosted by ESA in Italy.

CEOS is currently chaired by NOAA Assistant Administrator for Satellites and Information Gregory Withee. Under Mr. Withee's leadership, CEOS is focusing on four priority areas: data utilization, the WSSD-Follow-up Program, the Integrated Global Observing Strategy Partnership (IGOS-P) and, finally, the harmonization among coordination groups. This last issue, harmonization among various coordination groups including CGMS, the WMO Consultative Groups, and CEOS is the most important and closely related to the EO World Summit issues. Dr. Tillman Mohr, Director-General of EUMETSAT, leads the Strategic Implementation Team (SIT) in identifying inadequacies and evaluating how best to maximize efforts to achieve common goals among these groups, so that we can more effectively coordinate our common goals.

Critical Needs

The big unknowns in climate change at present are the role played by clouds and aerosols, exchanges between the ocean and the atmosphere, carbon sources and carbon sinks, the effects of changing land use, the role of the polar ice-caps and, crucially, the effects of complex coupling in the "climate machine" between different types of atmospheric pollution, between changes to the ozone layer and the greenhouse effect. As for natural disasters, while the past decade has seen encouraging advances, the triggering mechanisms, the response of the environment and the impact of human activity on these mechanisms are still elusive.

Domestic and international policy decisions must be based on solid scientific fact where natural phenomena are concerned. The emphasis should thus be on thorough investigation of the relevant natural processes, as scientific understanding remains incomplete on a significant number of questions. While progress has been made recently on the dynamics of the evolving environment and the causes of natural

disasters, considerable uncertainty remains in many areas, demanding a sustained effort to improve our scientific models and acquire long-term observational data to feed these models. Comprehensive and continuous environmental data collection must be the first objective of space agencies, given that analysis and understanding of the environment and its interaction with human society are only possible on the basis of long-duration observation. This will make it possible to identify what processes are responsible for the gradual deterioration of resources and the global environment, and to produce sophisticated forecasting models able to take into account natural processes and human choices on matters such as energy supplies, industry and agriculture, land-use planning and urbanization, and, most importantly, society's future needs and growth capacity.

Amongst the inadequacies of existing Earth Observation systems, one of the most important is the lack of timeliness and the insufficient frequency of observations. For example, in order to provide useful information to support prevention, assessment and support in case of natural disasters, frequent coverage and near real time access to information, not data, is a crucial requirement, a must. Today, after thirty years, Earth Observation still remains largely an R&D tool. Despite the many Earth Observation satellites in orbit, it is not yet possible to get "the right information at the right time". When used separately, few if any of the current in-orbit systems can provide operational information to a wide community of users, whereas used in a cooperative way, as a single interoperable system, they could.

Therefore, without waiting for large dedicated satellite constellations, the situation can be improved significantly by better coordinating existing satellite sources even of different resolution, quality, etc. Currently, more than 50 Earth Observation satellites are in orbit worldwide, carrying more than 150. Among those, there are about 15 civilian Earth observation satellites available, which provide imaging data in the 1-30 meters resolution range using optical, infrared or radar sensors. Each of these instruments has its own specific purpose, but there is a clear lack of a coordinated and synergistic approach to fully exploit the very large volume of available measurements. A major opportunity is within reach at this moment in time to overcome the individual shortcomings of each mission by jointly exploiting this multitude and variety of instruments and thus easing the task of building and providing continuous

information and operational services. These services will be characterized by a stronger integration of space data with all kinds of other data and information and require a knowledge-based approach making full use of scientific expertise in Earth sciences, information technologies, economics and social sciences.

Early Achievements

The International Charter on Space and Major Disasters is a good example of how CEOS induced a better coordination among space agencies. The "Charter" combines the efforts of a number of space agencies to prioritize its satellite observation capabilities in case of natural disasters. The Charter is working successfully and provides to civil protection agencies throughout the world access to data from a range of satellites. During 2002, 7 major disasters were covered by the Charter. This was supplemented by another 8 activations for minor disasters, out of about a hundred which occurred worldwide.

The Global Precipitation mission (GPM) is another ongoing coordination effort initiated through CEOS. It aims at providing 3-hourly updates of rainfall at global level, available within tens of minutes after acquisition. This constellation of satellites will enormously improve global weather predictions and save life and property, for example through better forecast of floods.

Such enterprises require more than one nation or agency to afford the complexity and frequency of observations needed. Today, several space agencies world-wide contribute to these international efforts, including America's NASA and NOAA, Europe's ESA and CNES, Canada's CSA, Japan's NASDA, India's ISRO, and Argentina's CONAE. Others will join soon.

The biggest challenges the space community faces are to improve observation capabilities on one side, but, almost equal in terms of importance, to improve the benefits of space for the many user communities. More efficient models, improved algorithms and better accessibility of data are obviously needed to take full benefit from space observations. The work of CEOS is entirely devoted to meeting these objectives.